AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of the claims and all prior listings of the claims in the present application.

1. (currently amended) A method of reducing noise in a multiple carrier modulated (MCM) signal that has been equalized, the method comprising:

estimating impulse noise [[based]] in the equalized signal; and

removing a portion of the noise [[upon]] from the equalized signal as a function of the estimated impulse noise.

2. (currently amended) The method of claim 1, wherein the ~~multi-carrier-modulated~~ MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

3. (currently amended) The method of claim 1, wherein [[the]] removing ~~step removes the~~ a portion of the noise also removes the portion of the noise from the equalized signal as a function of an estimated channel transfer function ($\hat{H}$).

4. (currently amended) The method of claim 1 [[3]], wherein at least part of [[the]] removing [[step]] a portion of the noise takes place in a frequency domain.

5. (currently amended) The method of claim 3 [[4]], wherein [[the]] removing ~~step removes the~~ a portion [[by]] of the noise comprises:

taking [[the]] a matrix product of the estimated impulse noise and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$)[[,]]; and

subtracting the matrix product from the equalized signal.

6. (currently amended) The method of claim 3, wherein at least [[a]] part of [[the]] removing [[step]] a portion of the noise takes place in a time domain.

7. (currently amended) The method of claim 3 [[6]], wherein [[the]] removing ~~step includes~~ a portion of the noise comprises:

subtracting [[the]] a time-domain ~~approximated~~ estimated impulse noise from [[the]] a received signal to form a compensated version of the ~~received-signal~~ received signal.

8. (currently amended) The method of claim 7, wherein [[the]] removing [[step]] a portion of the noise further ~~includes~~ comprises:

taking [[the]] a fast Fourier transform (FFT) of the time-domain compensated ~~received-signal~~ received signal to produce a frequency-domain version of the time-domain compensated ~~received-signal~~[[,]] received signal; and

taking [[the]] a product of the frequency-domain version of the time-domain compensated ~~received-signal~~ received signal and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$).

9. (currently amended) The method of claim 1, wherein [[the]] estimating ~~step includes~~ impulse noise comprises:

~~approximating~~ estimating total noise in the equalized signal[[,]]; and

~~approximating~~ estimating the impulse noise based [[up]]on the ~~approximated~~ estimated total noise.

10. (currently amended) The method of claim 9, wherein at least part of ~~the step of approximating~~ estimating the impulse noise takes place in a time domain.

11. (currently amended) The method of claim 9 [[10]], wherein ~~the step of approximating~~ estimating the impulse noise ~~includes~~ comprises:

using peak-detection to produce a time-domain version of the estimated impulse noise based [[up]]on a time-domain version of the ~~approximated~~ estimated total noise.

12. (currently amended) The method of claim 9, wherein at least part of ~~the step of approximating the~~ estimating total noise takes place in a frequency domain.

13. (currently amended) The method of claim 9 [[12]], wherein ~~the step of approximating the~~ estimating total noise ~~includes~~ comprises:

estimating a baseband signal that includes a set of transmitted symbols;

subtracting the estimated baseband signal from the equalized signal to form a set of differences; and

multiplying the set of differences by an estimated channel transfer function ($\hat{H}$).

14. (currently amended) The method of claim 9, wherein at least part of ~~the step of approximating the~~ estimating total noise takes place in a time domain.

15. (currently amended) The method of claim 9 [[14]], wherein ~~the step of approximating the~~ estimating total noise ~~includes~~ comprises:

estimating a baseband signal that includes a set of transmitted symbols;

taking [[the]] a matrix product of the estimated baseband signal and an estimated channel transfer function ($\hat{H}$) to form a frequency-domain product;

taking [[the]] an inverse fast Fourier transform (IFFT) of the frequency-domain product to form a time-domain version of the product; and

subtracting the time-domain version of the product from [[the]] a received signal to form a time-domain version of the estimated total noise.

16. (currently amended) The method of claim 1, wherein[[: the]] estimating [[step]] impulse noise and [[the]] removing [[step]] a portion of the noise can be performed iteratively,

wherein a first [[such]] iteration ~~resulting~~ results in a first noise-reduced version of the equalized signal[[; and]],

wherein the method further ~~including~~ comprises making a second iteration of [[the]] estimating [[step]] impulse noise and [[the]] removing [[step]] a portion of the noise in which [[the]] estimating [[step]] impulse noise operates [[up]]on the first noise-reduced version of the equalized signal[[;]], and

wherein the second iteration ~~producing~~ produces a second noise-reduced version of the equalized signal [[which]] that has a lower noise content than the first noise-reduced version.

17. (currently amended) The method of claim 16, further comprising:

making a third iteration of [[the]] estimating [[step]] impulse noise and [[the]] removing [[step]] a portion of the noise in which [[the]] estimating [[step]] a portion of the noise operates [[up]]on the second noise-reduced version of the equalized signal;

wherein the third iteration produces a third noise-reduced version of the equalized signal [[which]] that has a lower noise content than the second noise-reduced version.

18. (original) The method of claim 1, further comprising:

clipping, prior to equalizing the MCM signal, peaks above a threshold;

wherein the equalized signal is an equalized version of the clipped MCM signal.

19. (currently amended) The method of claim 18, wherein [[the]] clipping [[step]] peaks above a threshold clips the MCM signal to either a threshold level or to zero.

20. (currently amended) An apparatus for reducing noise in a received multiple carrier modulated (MCM) signal, the apparatus comprising:

a Fourier transformer operable [[up]]on the received MCM signal;

an equalizer operable to equalize a Fourier-transformed signal from the Fourier transformer; [[and]]

a total-noise estimator operable to estimate [[a]] total noise in the equalized signal from the equalizer;

an impulse-noise estimator operable to estimate impulse noise based [[up]]on the estimated ~~total-noise~~ total noise; and

a noise compensator operable to remove a portion of ~~impulse-noise on~~ impulse noise from the equalized signal as a function of the estimated ~~impulse-noise~~ impulse noise.

21. (original) The apparatus of claim 20, wherein the MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

22. (currently amended) The apparatus of claim 20, wherein the noise compensator also is operable [[also]] to remove a portion of impulse noise from the equalized signal as a function of an estimated channel transfer function ($\hat{H}$).

23. (currently amended) The apparatus of claim 20 [[22]], wherein at least part of removal by the noise compensator [[is]] takes place in a frequency domain.

24. (currently amended) The apparatus of claim 22 [[23]], wherein the noise compensator is operable to remove a portion of impulse noise by:

taking [[the]] a matrix product of the estimated impulse noise and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$)[[,]]; and

subtracting the matrix product from the equalized signal.

25. (currently amended) The apparatus of claim 20 [[22]], wherein at least part of removal by the noise compensator [[is]] takes place in a time domain.

26. (currently amended) The apparatus of claim 22 [[25]], wherein the noise compensator further is ~~further~~ operable to remove a portion of impulse noise by:

subtracting [[the]] a time-domain ~~approximated~~ estimated impulse noise from the received MCM signal ~~in the time domain~~ to form a time-domain compensated signal.

27. (currently amended) The apparatus of claim 26, wherein the noise compensator further is ~~further~~ operable to:

take [[the]] a fast Fourier transform (FFT) of the time-domain compensated signal to produce a frequency-domain version of the time-domain compensated signal; and

take [[the]] a product of the frequency-domain version of the time-domain compensated signal and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$).

28. (currently amended) The apparatus of claim 20, wherein the impulse-noise estimator is operable to estimate [[the]] impulse noise in [[the]] a time domain.

29. (currently amended) The apparatus of claim 28, wherein the impulse-noise estimator is operable to estimate impulse noise by:

using peak-detection to produce a time-domain version of the estimated impulse noise based [[up]]on a time-domain version of the ~~approximated~~ estimated total noise.

30. (currently amended) The apparatus of claim 20, wherein the total-noise estimator is operable to provide the estimated total noise in [[the]] a frequency domain.

31. (currently amended) The apparatus of claim 30, wherein the total-noise estimator is operable to ~~approximate~~ estimate the total noise by:

estimating a baseband signal that includes a set of transmitted symbols;

subtracting the estimated baseband signal from the equalized signal to form a set of differences; and

multiplying the set of differences by an estimated channel transfer function ($\hat{H}$)[[,]] ~~respectively~~.

32. (currently amended) The apparatus of claim 20, wherein the total-noise estimator is operable to provide the estimated total noise in [[the]] a time domain.

33. (currently amended) The apparatus of claim 32, wherein the total-noise estimator is operable to ~~approximate~~ estimate the total noise by:

estimating a baseband signal that includes a set of transmitted symbols;

taking [[the]] a matrix product of the baseband signal and an estimated channel transfer function ($\hat{H}$) to form a product;

taking [[the]] an inverse fast Fourier transform (IFFT) of the product to form a time-domain version of the product; and

subtracting the time-domain version of the product from [[the]] a received signal to form a time-domain version of the estimated total noise.

34. (currently amended) The apparatus of claim 20, wherein one of the following applies:

the equalizer is operable to determine an inverse ($\hat{H}^{-1}$) of an estimated channel transfer function ($\hat{H}$) and the noise compensator is operable to invert the inverse ($\hat{H}^{-1}$) to produce the estimated channel transfer function ($\hat{H}$);

the equalizer is operable to determine the estimated channel transfer function ($\hat{H}$) and the noise compensator is operable to produce the inverse ($\hat{H}^{-1}$); and

the equalizer is operable to produce both the inverse ($\hat{H}^{-1}$) and the estimated channel transfer function ($\hat{H}$).

35. (currently amended) The apparatus of claim 34, wherein[[:]] the total-noise estimator, the impulse-noise estimator, and the noise compensator are arranged in a first stage, [[and]]

wherein the first stage is operable to output a first noise-reduced version of the equalized signal ~~is a first such version~~[[;]], and

wherein the apparatus further includes at least a second stage ~~having corresponding~~ that includes:

a second total-noise estimator operable [[up]]on the first noise-reduced version of the equalized signal fed back [[there]]to the second total-noise estimator[[,]];

a second impulse-noise estimator[[,]]; and

a second noise compensator operable to output a second noise-reduced version of the equalized signal [[which]] that has a lower noise content than the first noise-reduced version.

36. (currently amended) The apparatus of claim 35, wherein the second total-noise estimator also is [[also]] operable [[up]]on [[the]] a received signal fed forward [[there]]to the second total-noise estimator.

37. (currently amended) The apparatus of claim 35, wherein the apparatus further comprises at least a third stage ~~having~~ that includes:

a ~~corresponding~~ third total-noise estimator operable [[up]]on the second noise-reduced version of the equalized signal fed back [[there]]to the third total-noise estimator[[,]];

a third impulse-noise estimator; and

a third noise compensator operable to output a third noise-reduced version of the equalized signal [[which]] that has a lower noise content than the second noise-reduced version.

38. (currently amended) The apparatus of claim 37, wherein the ~~second~~ third total-noise estimator also is [[also]] operable [[up]]on [[the]] a received signal fed forward [[there]]to the third total-noise estimator.

39. (currently amended) The apparatus of claim 20, ~~wherein: the apparatus~~ further ~~comprises~~ comprising:

a first fast Fourier transformer (FFTR) to provide a frequency-domain version of [[the]] a received signal to the equalizer; [[and]]

wherein the impulse-noise estimator includes an inverse [[FFT]] fast Fourier transformer (IFFTR) and a second FFTR,

wherein the IFFT ~~providing~~ provides a time-domain version of the total noise,

wherein the impulse-noise estimator [[being]] is operable to provide a time-domain estimate of the impulse noise based [[up]]on the time-domain ~~estimated~~ version of the total noise, and

wherein the second FFT [[being]] is operable to provide a frequency-domain version of the time-domain estimated impulse noise.

40. (currently amended) The apparatus of claim 20, wherein[[:]] the impulse-noise estimator is operable, in part, to make an inverse fast Fourier (IFF) transformation[[;]],

wherein the noise compensator is operable, in part, to make a fast Fourier (FF) transformation[[;]],

wherein the apparatus further comprises a fast Fourier transformer (FFTR)[[;]],

wherein the apparatus [[being]] is configured to selectively connect the FFTR according to at least three layouts,

wherein a [[the]] first layout ~~having~~ has connections such that operation of the FFTR can provide a frequency-domain version of the received MCM signal to the equalizer,

wherein a [[the]] second layout ~~having~~ has connections such that operation of the FFTR can form a part of the IFF transformation, and

wherein a [[the]] third layout ~~having~~ has connections such that operation of the FFTR can form a part of the FF transformation.

41. (currently amended) The apparatus of claim 40, wherein[[:]] the first, second, and third layouts are part of a first arrangement, [[and]]

wherein the first arrangement is operable to output a first noise-reduced version of the equalized signal ~~is a first such version~~[[; and]],

wherein the apparatus further [[being]] is organized to selectively adopt [[a]] at least a second arrangement in which the second layout operates [[up]]on the first noise-reduced version of the equalized signal fed back [[there]]to the second layout[[;]], and

wherein the noise compensator in the second arrangement is operable to output a second noise-reduced version of the equalized signal [[which]] that has a lower noise content than the first noise-reduced version.

42. (currently amended) The apparatus of claim 41, wherein[[:]] the apparatus is further [[being]] organized to selectively adopt at least a third arrangement in which the ~~second~~ third layout operates [[up]]on the second noise-reduced version of the equalized signal fed back [[there]]to the third layout[[;]], and

wherein the noise compensator in the third arrangement is operable to output a third noise-reduced version of the equalized signal [[which]] that has a lower noise content than the second noise-reduced version.

43. (currently amended) An apparatus for reducing noise in a ~~multi-carrier-modulated~~ multiple carrier modulated (MCM) signal, the apparatus comprising:

a down-converter;

an analog-to-digital converter to digitize [[the]] output of the down-converter;

a guard-interval removing unit operable [[up]]on the digitized output of the down-converter; and

a combined fast Fourier transform (FFT), equalization, and impulse-noise-compensation unit operable [[up]]on a signal from the ~~guard-interval-removing~~ guard-interval removing unit.

44. (currently amended) The apparatus of claim 43, wherein the combined FFT, equalization, and impulse-noise-compensation unit ~~includes~~ comprises:

an equalizer operable [[up]]on the signal from the guard-interval removing unit;

a total-noise estimator operable [[up]]on a signal from the equalizer;

an impulse-noise estimator operable [[up]]on a signal from the total-noise estimator; and

a noise compensator operable [[up]]on the signal from the equalizer and the signal from the impulse-noise estimator.

45. (currently amended) The apparatus of claim 43, wherein the ~~multi-carrier-modulated~~ MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

46. (currently amended) A method of reducing noise in a received multiple carrier modulated (MCM) signal that has been partially equalized, the method comprising:

estimating impulse noise based [[up]]on the partially-equalized signal; and

removing a portion of the noise in the received MCM signal in ~~the time-domain~~ a time domain as a function of the estimated impulse noise.

47. (currently amended) The method of claim 46, wherein[[: the]] removing [[step]] a portion of the noise in the received MCM signal produces a time-domain compensated signal[[;]], and

wherein the method further comprises:

equalizing a frequency-domain version of the time-domain compensated signal.

48. (currently amended) The method of claim 47, wherein [[the]] equalizing [[step]] a frequency-domain version of the time-domain compensated signal equalizes as a function of an estimated channel transfer function ($\hat{H}$).